A SYSTEM OF ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

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PART VIII.—THE BRAIN,

SECOND AND CONCLUDING PORTION.

COLOURED AFTER NATURE.

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TO

JAMES BLUNDELL, M.D.

LECTURER ON PHYSIOLOGY AND MIDWIFERY IN THE UNITED

HOSPITALS OF ST. THOMAS AND GUY;

WHOSE INDEFATIGABLE RESEARCHES IN

PHYSIOLOGY AND PATHOLOGY,

HAVE SO ELUCIDATED ABDOMINAL SURGERY,

AS TO RENDER IT

AS SIMPLE AND SAFE AS THE AMPUTATION OF A LIMB;

THIS PART IS INSCRIBED,

BY HIS VERY OBEDIENT SERVANT,

THE AUTHOR.

PART VIII.—THE BRAIN,

SECOND AND CONCLUDING PORTION.

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THE BRAIN.

A DELICATE medullary web or expanse, marked v, in Plates V. and XIV., is observed extending from the corpora quadrigemina e, *e*, to the cerebellum B; and in some instances, transverse striæ of cineritious matter are found on this web, which is named valvula Vieussenii;* it assists in forming the connecting link between the cerebrum and cerebellum, and contributes to form the iter à tertio 3, ad quartum ventriculum 4,† marked with a dotted line in Plate XIV. This canal is formed basilad or inferiorly by the crura cerebri g, and superiorly or coronad by the posterior commissure *p*, the corpora quadrigemina e, *e*, and this medullary velum v, also laterad, or on each side by all these bodies. The iter à tertio ad quartum ventriculum is apparent in the fetus of seven weeks, is very large at this period, and open superiorly or coronad, the two sides of the cerebral and cerebellic masses being separated; at eleven weeks, these bodies are found united, and the tube completed, so that

* Syn. Velum cerebri medullare: Velum interjectum Halleri: Valvula cerebri: Great valve of the brain: La lame medullaire du cervelet: Valvula: Frenulum: Voile médullaire supérieur du Reil.

† Syn. Aquæductus Sylvii: Canalis medius: Iter ad quartum ventriculum.

at this period the valve of Vieussens is also formed. The valve of Vieussens is connected laterally with the bold medullary substance, extending from the testis *e*, to the cerebellum B, which is termed the processus cerebelli ad testes,* and is marked *l*, in Plate XIV. This medullary process is part of the crus cerebelli, marked *n*; and is visible at the eleventh week of the fetal life.

The cerebellum B, B,† in Plates I. II. V. IX. X. XIII. and XIV., is that portion of the brain situated beneath or basilad to the tentorium *d*, resting on the two inferior depressions *u*, *u*, of the occipital bone in *Fig.* 3 of Plate IV. of Part I., and in Plate XI. of this Part, the same letters being employed, although the bone in the latter is invested with the dura mater. It is divided, like the cerebrum, into two hemispheres,‡ marked with the letters B, B, and by Malacarne, Reil, Bichat, and Gordon, subdivided into several lobes, lobules, and laminar leaflets; this subdivision, however, appears unnecessary, and has therefore been discarded. To enable the dissector to examine the cerebellum with any satisfaction, the whole brain must be removed from the calvarium. In Plates I. X. and XIII., we observe distinctly two hemispheres, which are separated by the falx cerebelli, marked δ, in Plate XI.; but in Plate IX. these are observed to be united, in consequence of the falx not extending so high up, or coronad, which bond of union has been fancifully named superior vermiform process;§ the

* Syn. The pillars of the Vieussenian valve: Superior peduncle: Ascending portion of the limb of the cerebellum.

† Syn. Parencephalis: Cerebrum posterius: Pars posterior cerebri: Le petit cerveau: Le cervelet.

‡ Syn. Globi cerebelli: Lobes du cervelet.

§ Syn. Le ver supérieur du cervelet: L'eminence vermiforme: Ligne médiane

inferior vermiform process being a continuation of this to the base of the cerebellum. The outer or peripheral surface of the cerebellum has a number of furrows, or sulci, which run horizontally, and somewhat regularly, but not so deep as those of the cerebrum, dividing it into laminæ or plates; and hence we observe a difference between the outer surface, or convolutions of the cerebrum, and these plates of the cerebellum.

When a section is made between the two hemispheres B, B, an elegant arborescent appearance presents itself, formed by the divarication of the medullary in the cineritious matter, which is named arbor vitæ; the root or concentration of which, marked *m*, in Plate XIV. is considered the commissure of the cerebellum, and forms the roof of the fourth ventricle,* marked 4, in Plate V., which is fully displayed when the two hemispheres B, B, are bisected, as in Plate XIV. The floor of the cavity is formed by the spinal cord C, and the tuber annulare, the sides by the crura cerebelli *n*, the anterior or glabellar margin by the valve of Vieussens V, and the posterior or inial, or inio-sacral margin, by the valve of Tarin *r*. These are seen partly in Plate V., and partly in Plate XIV. An expanse of the pia mater is described by authors as forming a tissue, like the choroid plexus in the lateral ventricles; but I have never witnessed any vascular plexus deserving this appellation. In Plate V., there is observed in this fourth ventricle, marked 4, a line extending longitudinally, which is named calamus scriptorius. The fourth ventricle, between the fifth and sixth week of the fetus, is

et ondulée des lobules supérieures du cervelet: Vermis superior: Epiphysis scolecoëides.

* Syn. Le ventricule du cervelet: The central fissure of the cerebellum.

an open cavity, communicating freely with a long canal or tube, extending along the spine, and with the third ventricle, and is not roofed in until the eleventh week. The valve of Tarin,* marked *r*, in Plate V., is a delicate medullary web, extending between the posterior part of the hemispheres B, B, of the cerebellum, and the spinal cord C, thus shutting up the fourth ventricle. This valve is perceptible at the seventh month of the fetal life.

The general medullary matter of the cerebellum appears produced from two processes or prolongations, named crura cerebelli,† marked *n*, in Plates XIII. and XIV., which are large roundish medullary pillars, extending upwards from the tuber annulare E, into the mass of the hemispheres, where they radiate to form the arbor vitæ,‡ as represented in Plates V. and XIV., and which are convex outwardly or peripherad, and slightly concave inwardly or centrad. In their ascent they form the sides of the fourth ventricle, marked 4, in Plates V. and XIV., and the commissure of the cerebellum,§ marked *m*, in Plate XIV. Their anterior, or glabello-coronal aspect *l*, Plate XIV., and *Fig.* 2 of Plate XII., is termed processus cerebelli ad testes,|| and their posterior or basilar aspect, marked *o*, in Plates XIII. and XIV., and in *Fig.* 2 of Plate XII., which connects the medullary

* Syn. Inferior medullary valve of Reil: Valvulæ semicirculares, inferiores et posteriores quarti ventriculi: Posterior medullary velum of the cerebellum.

† Syn. Peduncles of the cerebellum: Racines du cervelet: Les bras du cervelet: Les jambes ou les petits cuisses du cervelet: Les petits branches de la moëlle alongée.

‡ Syn. Centrum medullare hemispheriorum cerebelli.

§ Syn. Mons cerebelli.

|| Syn. Processus ad corpora quadrigemina: La portion ascendante des bras du cervelet: Le pédoncule supérieur du cervelet.

matter of the cerebellum with the spinal cord, is named processus cerebelli ad medullam oblongatam.* The aspect between these, which looks outward or peripherad, and descends to, or ascends from the tuber annulare, or pons Varolii, E, is marked *n*, in Plate XIII., and in *Fig.* 2 of Plate XII., and named processus ad pontem Varolii.† In making a slightly oblique section of the crus cerebelli, near the part where it branches out in the hemispheres, we perceive an oval-shaped serrated mass, of a delicate yellowish-red colour, named corpus dentatum,‡ represented in *Fig.* 3 of Plate XII., marked D.

In the fetus, between the fifth and sixth week after conception, the brain appears a sac, or pouch, with slight longitudinal and transverse depressions, presenting the appearance of several small vesicles agglomerated together; between the seventh and eighth week, the tentorium is seen separating the mass into cerebrum and cerebellum, and the latter consists of two thin narrow plates, which incline inward, and are applied to each other, but do not unite; at the ninth week, the processus cerebelli ad medullam oblongatam are found arising from the spinal cord, (which consists of two portions,) in the figure of two plates, bending forwards to meat each other, in order to form the cerebellum, the latter of which is very narrow and thin, ribboned, and convex without, and concave within; these two processes are not symmetrically applied

* Syn. Processus a cerebello ad medullam spinalem: Corpus restiforme: Le corps pyramidal postérieur: Colonne de la moëlle alongée: Portion descendante des bras du cervelet: Prolongement du cervelet vers la moëlle alongée.

† Syn. Processus anterior.

‡ Syn. Corpus ciliare: Corpus rhomboideum: Corpus serratum: Le corps dentelé: Le corps festonné du cervelet: Le corps frangé: Zigzag: Ganglion du cervelet: Le noyau.

to each other, the right advancing before the left. At the eleventh week, the crura or peduncles of the cerebellum extend forwards and outwards, or coronad and laterad, with a slight curvature, and are united by a narrow junction at the mesial or median line, and the external surface of the cerebellum is convex, smooth, and without furrows; at the fourth month, or between fourteen and fifteen weeks, the cerebellum is broader in its transverse or lateral diameter, than in the perpendicular or mesial line, and where the processus cerebelli ad medullam oblongatam may be said to enter the cerebellum, a small round swelling is visible, which appears to be the origin of the corpus dentatum; at the fifth month, the exterior surface presents the division into two hemispheres, each having four transverse lines or furrows, subdividing it into the five lobules of Reil, whose stems have no branches or ramifications, or divarications, as in the adult; at the sixth month, the transverse lines are very deep, and on making a perpendicular section, the ramification of the medullary matter is seen, as in the adult, and the processus cerebelli ad testes are fully developed; at the seventh month, the exterior surface presents a great number of transverse furrows, some of which penetrate more deeply than others; and when a perpendicular section is made, the stems, branches, and ramifications of Malacarne and Reil are observed, but not the leaves; at the eighth month, the cerebellum is nearly completed, the leaflets, however, are not so numerous as in adult life, and can be removed along with the pia mater, thus leaving the branches of the stems exposed; at the ninth month, the fissure separating the hemispheres is bold and distinct, the furrows are very numerous, the deepest of which separate the lobes, the less deep the

lobules, and the shallowest the leaflets or plates of Malacarne and Reil; the vermiform body, with all its divisions by these authors, as the short cross bands, the pyramid, the spigot, and the nodule, are developed; also the valve of Tarin, and the flocks, and the tonsils or almonds, of Malacarne and Reil.

I shall now proceed to the examination of the base of the brain; and to enable the dissector to examine this surface, the brain must be removed from the skull, by carefully dividing the various nerves, blood-vessels, and spinal cord, as they make their exit at the different foramina, having previously taken care to cut across on each side the tentorium cerebelli. Plates X. and XIII. represent the basis on which we observe the different convolutions of the cerebrum and lamellæ of the cerebellum, together with their divisions into hemispheres and lobes. The letters a indicate the anterior, *a* the middle, and a the posterior lobes of the cerebrum, the last of which are hid by the hemispheres B, B, of the cerebellum, in Plate X. In Plate XIII., these two great divisions of the brain appear to unite at E, the tuber annulare, by four large prolongations, named crura, those of the cerebrum being marked g, and those of the cerebellum *n*. The crura cerebri* g, g, are large round pillars of medullary matter, which ascend from the tuber annulare E, and radiate into the substance of the hemispheres, as seen in *Fig.* 4 of Plate XII. The crura cerebri are recognisable about the seventh week of the fetus, in the form of two lengthened cords.

The tuber annulare E,† Plate XIII., and *Fig.* 2 of

* Syn. Peduncles of the cerebrum: Processus medullæ cerebri.

† Syn. Pons Varolii: Protuberance annulaire ou semicirculaire: Ponticulus: Pons cerebelli: Protuberantia annularis Willisii: Protuberantia transversalis: Nodus encephali: Nodus cerebri: La grande réunion du cervelet.

Plate XII., is that large round eminence, apparently formed by the union of the crura cerebri g, g, and the crura cerebelli *n*, *n*, marked with transverse lines, and has a slight sulcus running perpendicularly or mesiad. The annular protuberance is observable at the fourth month of the fetus, being very narrow, and in the fifth month is clearly seen to be formed by medullary fibres, descending from the cerebellum, exterior to the processus cerebelli ad medullam oblongatam, and winding round the spinal cord, where they unite. Immediately anterior or glabellad to the tuber annulare E, and between the crura cerebri g, g, there is a small sulcus or aperture, which is named foramen cæcum anticum; and posterior or iniad and sacrad to the tuber E, and between the corpora pyramidalia G, G, is another sulcus or aperture named foramen cæcum posticum. Continuous with the tuber annulare E, and the crura cerebri g, g, et cerebelli *n*, *n*, downwards or sacrad, is the spinal cord, which on this aspect is observed to consist of four bodies, the corpora pyramidalia G, G, and the corpora olivaria F, F, the whole being named the medulla oblongata.* The corpora pyramidalia G, G,† are those oblong bundles of medullary matter, situate in the upper or atlantal region of the spinal cord, on its anterior or glabellar aspect, and which may be traced ascending within or centrad or corono-iniad of the tuber annulare E, to join or become the crura cerebri g, g. The corpora pyramidalia are not distinguishable till the fourth month, although the spinal cord is much more early

* Syn. Bulbus medullaris.

† Syn. Les éminences medianes: Corpora pyramidalia anteriora: Les éminences medianes du bulbe rachidien: Les corps olivaires: Corpora pyramidalia antica: Les bandes medullaires.

formed. The corpora olivaria F, F,* situate on the side of, or laterad to, the corpora pyramidalia, consist also of ascending medullary fibres. The corpora olivaria, although a component part of the spinal cord, which is very early formed in the fetus, are not fully developed until the seventh month. I shall defer the examination of the spinal cord, until I have finished the description of the base of the brain. Between the crura cerebri g, g, the tuber annulare E, and the tracts 2*, 2*, of the optic nerves 2, 2, are situated the two corpora mamillaria,† which are small round medullary eminences, that rest on the pituitary gland, and which form the commencements of the anterior pillars of the fornix. The corpora mamillaria appear as one large rude soft mass in the fetus of three months, and are not separated until the seventh month. Anterior or glabellad to the corpora mamillaria *s*, *s*, the infundibulum *i* is situated, which has been described in page 16 of Part VII.

The nerves which originate from the brain are divided by some authors into nine, and by others into twelve pairs; the latter of which arrangements I have preferred, as being more explicit. These are the first pair, or olfactory nerves, marked with the digits 1, 1; the second pair, or optic nerves, 2, 2; the third pair, or motores oculorum, 3, 3; the fourth pair, or pathetic nerves, 4, 4; the fifth pair, or trigemini, 5, 5; the sixth pair, or

* Syn. Corpora pyramidalia lateralia · Les corps pyramidaux : Corpora ovata : Corpus dentatum eminentiæ olivaris : Le ganglion ovale du grand renflement : Le ganglion olivaire.

† Syn. Apophyses : Corpora albicantia : Corpora candicantia : Tubercules pisiformes : Eminences mamillaires : Tubercules mamillaires : Les bulbes ou oignons de la voute à trois piliers : Tubera candicantia : Eminentiæ candicantes : Les éminences blanches.

abducentes, 6, 6; the seventh pair, or facial, 7, 7; the eighth pair, or auditory, 8, 8; the ninth pair, or glosso-pharyngeal, 9, 9; the tenth pair, or nervi vagi, 10, 10; the eleventh pair, or accessory nerves of Willis, 11, 11; and the twelfth pair, or lingual nerves, 12, 12.

The first pair, or olfactory nerves,* marked 1, 1, in *Fig.* 7 of Plate VII., in Plates X. XI., *Fig.* 5 of Plate XII. and Plate XIII., are delicate pulpy medullary objects, rather of a cineritious colour, deriving their origin apparently from the anterior lobes a, a, of the cerebrum, but which can be easily traced to arise from the medullary expanse of the corpora striata, which are hence named by Bichat, *couche du nerf ethmoidal*, and colliculus nervi ethmoidalis. In Plate XII. *Fig.* 5, the olfactory nerve of the left side is traced dividing into striæ, which are observed to come from the posterior or inial margin of the anterior lobe of the cerebrum, and to arise from the corpus striatum. As they proceed towards the cribriform lamella of the ethmoid bone, they form peculiar oblong turgescences, 1, 1, Plate X., which immediately before their emergence out of the cranium, 1, 1, Plates XI. and VII., divide into numerous small delicate threads, varying from twelve to fourteen in number, that are distributed on the mucous membrane investing the turbinated portions of the ethmoid bone, and the mesial septum of the nares. The olfactory nerves are not perceptible until the eleventh week of the fetus, and then they are very bulky, forming two little bands, which spring from the sylvian fissure, and end in a small round

* Syn. Olfactilia: Olfaciendi organa: Carunculæ mamillares: Processus medullares: Processus mamillares cerebri ad nares: Ductus nervei a media cerebri magnitudine ad supremam narium partem: Par primum, sive olfactorium, sive nervi olfactorii: Nervus olfaciens: Nerf ethmoidal ou olfactif.

tubercle; they are hollow, their cavity being continuous with the anterior cornu of the lateral ventricle, which is observable even in the seventh month.

The second pair, or optic nerves,* marked with the digits 2, in *Fig.* 7 of Plate VII., in Plates X. and XI., in *Fig.* 5 of Plate XII., and in Plate XIII., are large round nerves, which are observed in the two last of these Plates to twine round the crura cerebri g, g, where they are termed optic tracts, and are marked 2*; and their origins may be traced to the thalami F, F, and corpora quadrigemina e, *e*, as represented in *Fig.* 5 of Plate XII. The optic nerve, or optic tract 2*, is at first a flat medullary expanse, which in *Fig.* 5 of Plate XII., is observed to derive its origin partly from the thalamus F, and partly from the corpora quadrigemina e *e*, and, after descending round the crus g, of the cerebrum, becomes more condensed and cylindrical, unites with the opposite nerve 2, and again separates, in order to emerge from the cranium at the optic foramen, as delineated in Plate XI. The further course of this nerve will be traced in the Part comprehending the Organs of Sense.† We now observe the small elevation, which is named the corpus geniculatum externum f, in *Fig.* 5 of Plate XII., considered by some the commencement of this nerve. The optic tracts are flat onwards nearly to their union, and it is still undecided, whether this junction be merely a bond of union, or a decussation. Tiedemann found the nerves

* Syn. Prima nervorum a cerebro exorientium conjugatio: Nervus visivus seu visorius: Nervi optici sive secundæ conjugationis: Nerf oculaire ou optique.

† In Plate XI. the ophthalmic artery *o* is observed accompanying the optic nerve, a point of consideration for the practitioner in Amaurosis.

united in the third month of the fetus, and in the second month they were imperceptible; at the eleventh week, they were bulky, and could be traced into the thalami and the corpora quadrigemina; at the sixth month, the optic nerve, when raised from the crus cerebri, elevated along with it the corpus geniculatum externum, in the form of a layer, and the nerve could be traced into the thalami and corpora quadrigemina.

The third pair, or motores oculorum,* marked 3, 3, in *Fig.* 7 of Plate VII., and in Plates X. and XI., are moderately sized nerves, which are observed in the former of these to derive their origin from the crura cerebri, anterior to the margin of the tuber annulare E. Each nerve, however, can be traced to arise by two origins, the one running coronad and iniad, or upwards and backwards, to the medullary matter of the cerebellum; the other ascending coronad and glabellad, or upwards and forwards, between the crura cerebri, and along the thalamus, anterior or glabellar to the posterior commissure, until it is lost in the peduncle of the pineal gland. The nerve descends from its external origin to the side of the sella turcica, where it enters the cavernous sinus, as observed in Plate XI. to proceed out of the cranium, at the foramen lacerum anterius, to the muscles of the eye. These nerves are perceptible in the third month of the fetus.

The fourth pair, or pathetici,† marked 4, in *Fig.* 7 of Plate VII., and in Plates X. and XI., and in *Fig.* 2 of

* Syn. Second pair of Galen, Vesalius, &c.: Tertiæ conjugationis nervi of Vieussens, &c.: Nerf oculo-musculaire: Nerf oculo-musculaire commun: Nerf moteur commun des yeux ou de la troisième paire.

† Syn. Gracilior radix tertii paris of Vesalius: Par octavum of Fallopius: Nonum par of Columbus: Nervi quartæ conjugationis sive pathetici of Willis, &c.: Nerf oculo-musculaire interne: Trochleares.

Plate XII., are small delicate nerves, which derive their origin from the valve of Vieussens, marked v, in Plate V., and are hence connected both with the testes and cerebellum; they descend around the crura cerebri, to the folds of the tentorium, which they enter, as represented in Plate XI., and advance onwards through the cavernous sinus, as will be delineated in that Part on the Organs of Sense, to emerge at the foramen lacerum anterius, and to be expended on the superior oblique muscle of the eye. This nerve is observable in the third month of the fetal life.

The fifth pair, or Trigemini,* marked 5, in *Fig.* 7 of Plate VII., and in Plates X. and XI., large roundish-shaped nerves, appear to derive their origin from the side of the tuber annulare E, but each may be traced in the tuber annulare, dividing into two portions, the one ascending to join the crura cerebelli, the other ascending to the floor of the fourth ventricle. This nerve descends from its apparent origin at the tuber annulare, to enter the cavernous sinus, beneath or basilad to the tentorium, where it divides into its three branches, as will be described in that Part which treats of the Organs of Sense. This nerve is apparent in the fetus at three months.

The sixth pair, or abducentes,† marked 6, in *Fig.* 7 of Plate VII., and in Plates X. and XI., rather small nerves, appear to derive their origin between the tuber annulare E, and the medulla oblongata F, F, G, G, but each nerve may be traced upwards through the medulla oblongata to the corpus restiforme, or processus cerebelli

* Syn. Tertium par of Vesalius, &c.: Nervi gustatorii sympathatici medii: Tri-facial: Paire mixte.

† Syn. Radix gracilior quinti paris of Vesalius: Quartum par of Fallopius: Par octavum of Gaspar Bauhinus: Oculo-musculaire externe: Nervus timidus: Nerve oculaire externe: Nerf abducteur de l'œil: Nerf moteur oculaire externe.

ad medullam oblongatam. The sixth pair descend from the surface of the brain, to pierce the dura mater, investing the basis of the cranium, between the sella turcica and the foramen magnum, as represented in Plate XI. From this they advance onwards in the cavernous sinus to emerge at the foramen lacerum anterius, to supply the abductor muscles of the eyes. Their more minute description will be given under the organs of sense. This pair is observable in the fetus at the third month.

The seventh pair, or facial nerves,* marked 7 in *Fig.* 7 of Plate VII., and in Plates X. and XI., are small round nerves, which appear to derive their origin from the sides of the tuber annulare E, but each nerve may be traced through the substance of the tuber annulare, towards the floor of the fourth ventricle, dividing into two portions, the one ascending towards the cerebrum, the other descending to the cerebellum. This nerve proceeds almost directly across, accompanied with the auditory nerve, to the meatus auditorius internus, as delineated in Plate XI., the upper aperture of which it enters, and runs in the fallopian aqueduct, receiving a reflected twig from the vidian branch of the superior maxillary nerve, and giving origin to the chorda tympani, and twigs to the small muscles of the tympanum, as will be described in that Part which treats of the Organs of Sense. The nerve emerges at the foramen stylo-mastoideum, and is described in page 62 of Part II. This nerve is observable in the third month of the fetus.

* Syn. Pars quinti paris of Vesalius, &c. : Pars durior, vel potius nervus durus quinti paris of Fallopius : Ramus durior septimæ conjugationis : Communicans faciei : Portio dura of the seventh, the facial and auditory being formerly considered as one nerve.

The eighth pair, or auditory nerves,* marked 8, in *Fig.* 7 of Plate VII., and in Plates X. and XI., are large round soft nerves, which appear to arise from the sides of the tuber annulare E, but may be traced running upwards around the root of the processus cerebelli ad medullam oblongatam to the floor of the fourth ventricle. The auditory proceeds from the tuber annulare E, in company with the facial nerve, across to the meatus auditorius internus, as represented in Plate XI., the lower aperture of which it enters, dividing into minute filaments, to supply the labyrinth of the internal ear, as will be described under the Organs of Sense. This nerve is perceptible in the third month of the fetus.

The ninth pair, or glosso-pharyngeal nerves,† marked 9 in *Fig.* 7 of Plate VII., and in Plates X. and XI., derive their origin from the medulla oblongata, laterad or exterior to the corpora olivaria F, F, and proceed almost directly across to the foramina lacera posteriora, as represented in Plate XI., out of which they emerge, in company with the tenth, or nervi vagi 10, 10, the accessory nerves 11, 11, and the lateral sinuses *z*, *z*. The further distribution of these nerves is described in Part II. page 57. The origin of this nerve may be traced to the fourth ventricle, and the posterior part of the cerebellum. This nerve is observable in the third month of the fetus.

* Syn. Pars mollier quinti paris of Vesalius, &c. : Portion dure de la septieme paire ou du nerf auditif of Winslow, &c. : Nervus auditorius sive acousticus : Nerf labyrintheque : Portio mollis of the seventh, the facial and auditory having been formerly reckoned as one nerve.

† Syn. Pars sexti paris of Vesalius, &c. : Nervus anterior et minor sexti paris of Fallopius : Pars octavi paris : Par octavum : Petite portion ou première branche de la huitième paire : Pharyngo-glossien : Formerly part of the eighth, this, with the nervus vagus and accessory, having been considered one nerve.

The tenth pair of nerves,* marked 10, in *Fig.* 7 of Plate VII., and in Plates X. and XI., derive their apparent origin from the medulla oblongata, laterad or exterior to the corpora olivaria F, F, but can be traced to the fourth ventricle, and the posterior part of the cerebellum. They proceed almost directly across to the foramina lacera posteriora, as represented in Plate XI., out of which they emerge, in company with the ninth, or glosso-pharyngeal nerves 9, 9, the accessory nerves 11, 11, and the lateral sinuses *z*, *z*. The further distribution of this nerve is described in Part II. page 51. This nerve is observable in the third month of the fetal life.

The eleventh pair of nerves, or the accessory nerves to the nervi vagi,† marked 11, in *Fig.* 7 of Plate VII., and in Plates X. and XI., derive their origin from the posterior origins, or fasciculi, of the fourth, fifth, sixth, and sevent cervical pairs, within the theca vertebralis, as delineated in *Fig.* 7 of Plate VII., and in Plate II., ascend between the anterior and posterior fasciculi, enter the foramen magnum of the occipital bone, and proceed towards the nervi vagi 10, 10, which they accompany out of the foramina lacera posteriora, as described in Part II. page 57. These nerves are perceptible at the third month of the fetal life.

The twelfth pair, or lingual nerves,‡ marked 12, in

* Syn. Par sextum of Galen, &c. : Quinta conjugatio : Septimum conjugium : Sextum par : Nonus nervus capitis : Par octavum sive par vagum : Moyen sympathique, paire vague ou huitième paire : Nervus vagus : Pneumo-gastrique : Nerf vocal.

† Syn. Nervus spinalis sive accessorius ad par vagum : Nerfs accessoires de la huitième paire : Spinal or accessory nerve of Willis : Nerf spino-cranio-trapézien : Nerf trachélo-dorsal.

‡ Syn. Par septimum of Galen, &c. : Par octavum of Piccolhomini : Pars paris sexti of Casserius : Par decimum of Bartholinus : Par undecimum of Bidloo :

Fig. 7 of Plate VII., and in Plates X. and XI., appear to derive their origin from the medulla oblongata, between the corpora pyramidalia G, G, and olivaria F, F, as represented in Plate X.; but they can be traced into the medulla oblongata, dividing into two portions, the one ascending apparently to join the cerebrum, and the other descending to join the cerebellum.

Having finished the description of the nerves, I shall now proceed to that of the arteries of the brain. In page 40 of Part II., the internal carotid artery,* marked 19, in Plates VII. and VIII. of Part II., is described to its entrance into the canalis carotideus, (*t*, *Fig.* 2, Plate IV. Part I.) of the temporal bone; this artery is delineated in Plate II., in *Fig.* 7 of Plate VII., and in Plates X. and XIV. of Parts VII. and VIII.; in Plate II. it is merely represented ascending anterior, or sternad, to the bodies of the vertebræ x; but in Plate XIV., the artery is observed to ascend anterior to the vertebræ, and opposite to E, to become tortuous in its course through the temporal bone, which has been removed to exhibit this peculiar tortuosity. This winding course of the artery is also represented in some of the Plates illustrative of the Organs of Sense.

The internal carotid artery, after winding in its channel of the temporal bone, and by the side of the sella turcica of the sphenoid bone, where it is bathed in the blood of the cavernous sinus, and encircled by the threads of the

Par nonum of Willis: Grand Hypoglosse ou de la neuvième paire of Winslow: Nerf lingual ou de la douzième paire of Vicq D'Azyr: Nervus hypo-glossus, vulgo nervus lingualis medius sive nonus, quamvis sit nervorum cerebri revera duodecimus of Soemmering: L'hyo-glossien of Chaussier.

* Syn. Arteria carotis profunda: Arteria encephalica.

sixth pair and vidian, which form the great sympathetic nerve, emerges beyond the dura mater into the cavity of the cranium, as delineated in Plate XI.; and in this course gives origin to very small branches, which supply these nerves, and the third, fourth, and fifth pairs, which run in the cavernous sinus; also the dura mater in its vicinity, and the tunics of the carotid artery itself.

In Plate XI. the internal carotid artery 19 is observed after its entrance into the cranium, to give origin to a small branch, marked *o*, which is named the ophthalmic artery,* that emerges from the cranium at the optic foramen of the sphenoid bone, accompanied by the optic nerve 2; and which, before its emergence, gives off a small twig, that proceeds towards the olfactory nerve 1. The further distribution of the ophthalmic artery will be described under the Organs of Sense. The internal carotid, when minutely injected, is found, before its division into larger branches, to give origin to many small twigs or threads, which are ramified on the pituitary gland, the infundibulum, and the neighbouring parts.

The internal carotid artery, marked 19 in Plate X., ascends between the anterior a, and middle *a* lobes of the cerebrum, close to the optic nerve 2, and after a short course divides into an anterior v, a middle *y*, and a retrograde branch *t*. The last, or retrograde branch *t*, named lateral communicant, is either sent off from the trunk 19, before its division, as in this case, which, I may remark, is the general place of its origin, or it arises from the middle branch *y*. This small branch *t*, proceeds directly backwards or iniad, to unite with the posterior artery of the cerebrum *r*, the ultimate division of the basilar

* Syn. Ocular artery.

artery *q*; so that it may be said to be formed partly by each of these arteries.

The anterior branch v,* proceeds forwards and upwards, or glabellad and coronad, between the anterior lobes a, a, of the cerebrum, to the corpus callosum *w*, (as delineated in Plates IV. VI. VIII. IX. and XIV., but by mistake is marked *u*, in the last Plate,) along which this artery runs backwards or iniad, being gradually lost between the hemispheres, near the tentorium; and in this course, gives origin to numerous branches, the greater number of which supply the cerebral substance of the hemispheres, as illustrated by these Plates. The first conspicuous branch sent off, is marked *u*, in Plate X., which is observed to form a junction between the two anterior arteries v, v, and is hence named the anterior communicans. When the basis of the brain is first exposed, this branch is obscured by the tunica arachnoides, the approximation of the anterior lobes a, a, of the cerebrum, and by the optic nerves 2, 2. There are frequently more than one branch forming a communication between the anterior arteries of the cerebrum. No other branches of this artery are described, as they are very irregular. In Plate X. we observe several running on the surface of the two anterior lobes a, a, some of which are dipping into the substance of the cerebral matter, while others are inosculating with twigs of the middle branches *y*, *y*. In Plate XIV., which is a vertical section of the brain, the anterior artery, by mistake marked *u*, is seen ascending and running along the corpus callosum *w*, giving origin in this course to numerous branches, which ascend between the convolutions to the coronal surface of the hemisphere; some of

* Syn. Arteria callosa: Arteria cerebri anterior.

which run into the substance of the brain, and others inosculate with twigs of the posterior artery of the cerebrum, a branch of the basilar. In Plate II., several of the ultimate ramifications of this artery are seen, some of which terminate in the veins, while others anastomose with the small twigs of the middle artery of the cerebrum. In the different horizontal sections, represented by Plates VI. VIII. and IX., we observe the numerous subdivisions of this artery, indicated chiefly by the red dots in the anterior aspect of the cerebrum.*

The middle branch† of the internal carotid artery, marked *y*, in Plates X. IX. VI. IV. and II., ascends between the anterior a, and middle *a* lobes of the cerebrum, or in the fissure of Sylvius, to the exterior, or coronal and lateral surface of the hemisphere, as represented in Plates X. and II., where it inosculates with the twigs of the anterior and posterior arteries of the cerebrum; which inosculation is also delineated in Plate III. Before entering the fissure of Sylvius, this branch gives origin to twigs, which supply the crura cerebri, the base of the anterior and middle lobes, and the choroid plexus. In Plates IV. VI. and IX., is represented the manner in which the branches of this artery pierce the cerebral substance, and in comparing the two latter with Plate X. it will be easily understood, how this artery supplies the choroid plexus.

The two vertebral arteries, described in page 69 of

* This profuse distribution of blood-vessels, and their extreme delicacy, should be considered by the practitioner in determination of blood to the head, and in many diseases. The quantity of blood sent to the brain, compared with that to the rest of the body, is calculated by Malpighi to be one-third, by Haller to be one-fifth, and by Monro secundus to be one-tenth.

† Syn. Arteria Sylviana: Arteria cerebri media.

Part II., and represented in Plates I. and IV. of the same Part, marked R, also in Plate II., in *Fig.* 7 of Plate VII., in Plates X. XI., in *Fig.* 6 of Plate XII., and in Plate XIV. of the brain, ascend in the foramina of the transverse processes of the cervical vertebræ, anterior or sternal to the cervical nerves 21, 22, 23, in *Fig.* 6 of Plate XII., and enter the cavity of the cranium at the foramen magnum k, Plate XI. and in *Fig.* 6 of Plate XII., having previously pierced the dura mater and tunica arachnoides. The course of these arteries through the foramina of the five inferior or sacral cervical vertebræ is nearly straight, while that through the two superior, or the dentata and atlas, is fully more tortuous, as delineated in *Fig.* 6 of Plate XII., than the course of the internal carotids, immediately before their entrance into the cranium. On entering the cavity of the cranium, the vertebral arteries R, R, in Plate X., run along the medulla oblongata, and unite near the tuber annulare E, to form the basilar artery, marked *q*, which extends along the mesial line of this body, and at its anterior or glabellar margin, divides into the two posterior arteries *r*, *r*, of the cerebrum.

These ultimate branches *r*, *r*, ascend between the posterior lobes of the cerebrum and the hemispheres of the cerebellum, running on the former to the upper or coronal surface of the hemispheres of the cerebrum, where they unite with the ramifications of the middle and anterior arteries of the cerebrum, branches of the internal carotids. At their beginning, they give origin to the lateral communicants marked *t*, which, as mentioned in page 36, unite with either the trunk of the internal carotid 19, or with its middle branch *y*. These lateral communicants, with the ultimate division of the basilar artery, the

trunks of the internal carotid arteries 19, 19, their anterior branches v, v, and their anterior communicant *u*, form what is named the circle of Willis, thus effecting a free inosculation between the internal carotids and vertebrals, and shewing that little danger is to be apprehended from securing one of these arteries in the living body. From either these lateral communicants *t*, *t*, or from the commencements of the posterior arteries *r*, *r*, of the cerebrum, small twigs are sent off to the corpora mamillaria *s*, *s*, the infundibulum *i*, the optic nerves 2, 2, and the crura cerebri. As these posterior arteries ascend, they give origin to small branches, which supply the thalami, the corpora quadrigemina, the pineal gland, the choroid plexus, the fornix, and the third and lateral ventricles. These posterior arteries of the cerebrum are also seen in Plates VIII. and IX.

The vertebral arteries, in their course through the transverse processes of the vertebræ, give origin to small twigs, which enter the spinal canal, to supply the spinal cord and its tunics, as may be understood by examining Plate I. and *Fig*. 1 of Plate XV. Other branches, comparatively larger, emerge between the vertebral spaces, to supply the muscles of the neck, and to inosculate with the deep cervical and occipital arteries, the branches forming the junction with the latter, being marked *e*, in *Fig*. 6 of Plate XII.: those which form these anastomoses proceed from the trunk of the artery between the dentata and the atlas, and between the latter and the occipital bone. The vertebral artery, in its course between the atlas and foramen magnum, and before it pierces the dura mater, gives origin to the posterior artery of the dura mater, named posterior meningeal, which ascends between the occipital bone and the dura mater that encompasses the cerebel-

lum, to supply this membrane and the bone, as represented in Plate XI.; and generally inosculates with the middle meningeal artery.

Shortly after the vertebral arteries have pierced the dura mater, and entered the foramen magnum, they give origin to branches, which are named from their course anterior and posterior spinal arteries. The two posterior* are described descending on the posterior aspect of the spinal cord, anastomosing in their course downwards or sacrad with the small medullary branches of the vertebral, cervical, intercostal, and lumbar arteries, and also with the small branches of the anterior spinal arteries, to the cauda equina: but such a distribution is very seldom met with, as may be comprehended by examining Plate I. and *Fig.* 1 of Plate XV., which were drawn from two different subjects, one of which (Plate I.) was most minutely injected, while the other (Plate XV. *Fig.* 1) was taken from a young subject about three years old uninjected. In Plate I., these spinal arteries extend no length downwards or sacrad; and in *Fig.* 1 of Plate XV., there appears only one spinal artery descending and forming numerous inosculations with the medullary branches of the vertebral, cervical, dorsal, and lumbar arteries. These posterior spinal arteries frequently arise from the posterior or inferior cerebellar arteries.

The two anterior spinal arteries† are as small as the posterior, and derive their origin either from the vertebral arteries, or their junction the basilar; descend along the sternal aspect of the spinal cord for a short distance, and unite, continuing their course downwards or sacrad to the extremity of the cauda equina, and inoscu-

* Syn. Dorsal spinal arteries.

† Syn. Sternal spinal arteries.

lating with the medullary branches of the vertebral, cervical, dorsal, lumbar, and sacro-lateral arteries, and also with the posterior spinal twigs. The same irregularity exists in the extent of these, as in the posterior spinal arteries, for soon after their junction they often terminate, by inosculating with some of the medullary branches of the vertebral or cervical; the remainder, or sacral portion of the spinal cord, being supplied by the medullary branches of the intercostal, lumbar, and sacral arteries. After their union, and when this extends for any distance, the anterior spinal are more tortuous than the posterior spinal arteries. The medullary branches of the vertebral, cervical, intercostal, lumbar, and sacral arteries, like all small arteries, are very irregular, as is satisfactorily exemplified in Plate I., and *Fig.* 1 of Plate XV.

In Plate X., small branches marked *e*, are observed to arise, some from the vertebral arteries, and others from the basilar, which are named posterior or inferior cerebellar arteries;* those on the left side of the brain are two in number, while those on the right are three in number, the latter of which pursue the regular course around the medulla oblongata G, F, upwards to the basilar surface of the cerebellum B, B, and onwards even to its coronal aspect. In this course, they supply the corpora pyramidalia G, G, the corpora olivaria F, F, the lingual 12, the accessory 11, the pneumo-gastric 10, the glosso-pharyngeal 9, the auditory 8, the facial 7, and the abducentes 6, pairs of nerves; also the fourth ventricle, where they sometimes form a plexus, similar to the choroid in the lateral ventricles. These inferior cerebellar arteries are also seen in Plate IX.

* Syn. Arteriæ profundæ cerebelli.

When the basilar artery *q* has advanced to the anterior or glabellar margin of the tuber annulare E, it gives origin to the anterior or superior cerebellar arteries, marked *o*, *o*, Plate X., which wind round the tuber annulare E, ascending between the posterior lobes of the cerebrum, and the hemispheres of the cerebellum B, B, on the crura cerebelli, to the anterior and superior, or the glabellar and coronal aspect of the cerebellum. In this course, these arteries send branches to the tuber annulare E, the nerves in its vicinity, the crura cerebelli et cerebri, the velum interpositum of Haller, the pineal gland, the corpora quadrigemina, the valve of Vieussens, and the fourth ventricle. A small branch accompanies the facial and auditory nerves, to the meatus auditorius internus, to supply the internal organ of hearing, which is as frequently a direct branch from the basilar, as a subordinate one of the anterior cerebellar. In Plate X., this artery *o*, inosculates on the left side of the brain, with the posterior cerebellar artery *e*, and the vertebral artery R. The anterior cerebellar arteries are also seen in Plate V.

The other arteries which enter the cranium are distributed to the dura mater, and are named meningeal. The chief one is the middle meningeal,* marked 5* in Plates XI. and III., which derives its origin from the internal maxillary artery, as described in page 47 of Part II., enters the cranium at the foramen spinosum of the sphenoid bone, and ascends between the dura mater† and the bones of the cranium, imprinting the sphenoid, temporal, and

* Syn. Meningeal artery.

† When the meningeal artery is wounded, either by a blow on the head, or during the operation of trepanning, it may be easily secured by a ligature, by passing a curved needle between the vessel and the dura mater.

parietal, and supplying both these and the dura mater. Where the artery begins to imprint the parietal bone, which it does at its anterior inferior angle, or spinous process, it frequently forms for itself a complete canal or tube, from a line to a quarter of an inch in length.* These meningeal arteries are accompanied by venæ comites, which emerge at the foramina spinosa, and terminate in the internal jugular veins; and are very conspicuous in the fetal and youthful head. The other meningeal arteries are small subordinate twigs of the internal maxillary, the occipital, and the ascending pharyngeal, which enter the cranium at the foramen ovale and foramen lacerum posterius.

The veins which return the blood from the brain concentrate and form what are named sinuses. The veins marked with the digits 1, on the surface of the hemispheres, terminate in the superior longitudinal sinus, marked *x*,† as delineated in Plates I. II. III. IV. and XIV; in Plates III. and IV., these veins are observed to run from behind forwards, or from the inial to the coronal aspect, by which the venous circulation is apparently rendered tardy in its course. The superior longitudinal sinus *x*, begins about the crista galli of the ethmoid bone, as represented in Plates III. IV. and XIV., ascends in the

* In injuries of the head, in consequence of the meningeal artery being imbedded in the bone, it is very liable to be ruptured, apparently from the coats of the vessel not being able to yield when the blood is violently agitated by the shock; and when the operator conceives that blood is extravasated here, the course of the artery in the spinous process of the parietal bone may be ascertained by dividing the space between the external angular process of the frontal bone, and the centre of the external auditory meatus, into two proportional parts, and raising a perpendicular from this central point. The artery will then be found to run centrad of, or underneath, this perpendicular line, for some extent, coronad or upwards.

† Syn. First sinus.

middle or mesial line of the cranium,* running backwards or iniad to the tentorium, where it divides, and forms the two lateral sinuses marked *z*, in Plates II. IX. XI. and XIV. In the posterior or inial region of the superior longitudinal sinus, small threads of fibres are found stretching across, which are named chordæ Willisii, or Willisianæ; and where the different veins terminate in this sinus, there are elongations of the venous membrane with their free edges pointing forwards or glabellad into the cavity of the sinus, answering the purpose of valves. Similar fibres, threads, and membranous elongations, are observable in the lateral sinuses.

Each lateral sinus *z*, Plate XI.,† runs round in the folds of the tentorium *d*, to the petrous ridge of the temporal bone,‡ where it descends downwards or basilad, running a circuitous course in its groove of the occipital, parietal, and temporal bones, as displayed in Plate IV. *Fig.* 3 of Part I., marked *z*, *i*, *z*, to the foramen lacerum posterius, marked *w*, where it emerges out of the cranium,

* Since the superior longitudinal sinus or vein is strongly protected by the dura mater, as represented in Plate III., (for the veins supported by the dura mater possess the same tunics as other veins,) the operator may apply the trephine in this region, without any risk of wounding the vessel, if he proceeds with caution. This sinus must be carefully guarded against, when operating for the removal of water, in either acute or chronic Hydrocephalus.

† Syn. First and second sinuses of the ancients.

‡ The superior longitudinal sinus *x* divides into the two lateral, precisely opposite the protuberance of the occipital bone, and the lateral sinuses imprint the internal aspect of the mastoid processes of the temporal bones, so that by means of these processes of the occipital and temporal bones, the operator can calculate the course of these sinuses, and hence avoid them when applying the trephine in these regions. Beneath or basilad to the petrosal ridges, the trephine cannot be easily applied. In very rare instances, the superior longitudinal sinus has been found to divide at the beginning of the lambdoidal suture; but this deviation I have never witnessed.

and becomes the internal jugular vein, the course of which is described in page 51 of Part II. In this course, the lateral sinuses receive several veins or sinuses; indirectly the inferior longitudinal sinus G, Plate IV., which collects the blood from between the hemispheres, and from the surface of the corpus callosum, beginning at the anterior, or glabellar, or ethmoidal attachment of the falx cerebri ℧, and extending backwards or iniad in its folds to the tentorium *d*, Plate VIII., where it meets with the vena magna Galeni i, that collects the blood of the lateral, fifth, and third ventricles, together with the choroid plexuses and velum interpositum Halleri. The inferior longitudinal sinus G, uniting with the vena magna Galeni i, forms the fourth sinus,* mark IV. in Plates XIV. XI. and VIII., which runs backwards or iniad in the folds of the tentorium *d*, and terminates directly in the commencement of one of the lateral sinuses, which is almost invariably the left; sometimes, however, it ends in the superior longitudinal at its division into the two lateral sinuses; and the enlargement formed by this junction of the fourth with the left lateral, is named the torcular Herophili.† Considerable irregularity or variety is found both in the inferior longitudinal and the fourth sinus. The lateral sinus throughout its course receives several small veins directly from the cerebrum and cerebellum, similar to those which join or form the superior longitudinal; and the same arrangement of small veins is observable with respect to all the sinuses. In Plate IV.,

* Syn. Synus quartus perpendicularis: The internal sinus: The straight sinus: The torcular Herophili.

† Syn. Lenos Herophili: Pelvis: Laguncula: Palmentum: Tertia Vena: Platea: Lacuna: Cisterna.

several small veins are delineated, running in the folds of the falx cerebri ɒ, forming a communication between the superior *x*, and the inferior longitudinal G, sinuses, some of which are marked 2. Sometimes the one lateral sinus is larger than the other, and the right branches off the higher of the two, appearing to be the continuation of the superior longitudinal sinus; and Lieutaud mentions, that the left was deficient in one instance: again, in some cases, one of the lateral sinuses is the continuation of the fourth sinus, and has no connexion with the superior longitudinal, or the other lateral sinus, the latter of which is then very large; at other times, the occipital sinus has been found conveying the greater portion of the blood of the superior longitudinal, and extending around the foramen magnum to the foramina lacera posteriora, while the lateral sinuses have been found very diminutive. The lateral sinuses are observed sometimes to terminate in the external jugular veins.

The blood circulated by the ophthalmic arteries in the orbits, is returned into the cranium by the ophthalmic veins or sinuses, which enter at the foramina lacera anteriora, and terminate in the cavernous sinuses, one of the latter of which is marked C, in Plate XI. The ophthalmic veins will be represented in that Part which illustrates the Organs of Sense; so also will the cavernous sinuses. In Plate XI. of the brain, the cavernous sinus is shut up by the folds of the dura mater, which form its outer walls; when laid open, it is of an irregular triangular shape, extending from the pituitary gland to the spinous foramen of the sphenoid bone, and has a number of fibrous threads which traverse and give it a cellular appearance. A very small vein runs round the termination of the infundibulum *i*, at the pituitary gland,

between the latter and the dura mater, and terminates in the cavernous sinus, which is named the sinus of Ridley,* and which frequently cannot be observed, from its minuteness. Each cavernous c, Plate XI., ends in the superior petrosal sinus *p*, which is observed to run along the petrosal ridge of the temporal bone, in the folds of the tentorium *d*, and to end in the lateral sinus *z*. An inferior petrosal sinus, and an occipital sinus, are described by authors, but they are so irregular and small, that they appear not to deserve attention. The inferior petrosal, when present, extends along the angle formed between the squamous and petrous portions of the temporal bone to the lateral sinus.

An occipital sinus is found occasionally in the folds of the falx cerebelli δ, ending in one of the lateral sinuses, at the torcular Herophili, which sinus is sometimes double. In Plate XI., several small veins are delineated ascending between the dura mater and the occipital bone, and ending in the lateral sinuses, which are named by some authors the inferior lateral sinuses; sometimes similar veins are found on the cuneiform process of the occipital bone, and are named either petrous or lateral basilar sinuses, with a middle basilar sinus. A small vein is occasionally found extending across the cuneiform process near the posterior clinoid processes, forming a junction with the preceding lateral basilar sinuses, and is termed the transverse or posterior clinoid sinus. Two sphenoidal sinuses are also described; the one situated on the margin of the transverse spinous process of the sphenoid bone, named the superior, receiving blood from the orbit and dura mater, and emptying itself either into the oph-

* Syn. Posterior clinoid sinus, or elliptic sinus.

thalmic or cavernous sinus; the other, the inferior, which is situated on the cerebral or interior surface of the temporal process of the sphenoid bone, empties itself also into the cavernous sinus. These different small sinuses are so irregular, that they need not be taken into consideration, still less committed to memory, by the pupil.

The vertebral sinuses begin near the foramen magnum, and generally inosculate with the occipital and lateral basilar sinuses, descend in the beginning or atlantal aspect of the tube between the theca vertebralis and the vertebræ, then in the foramina of the transverse processes of the cervical vertebræ, and join the subclavian veins, as described in Part II., p. 69, and delineated in Plate I. of the same Part, collecting the veins from the spinal cord, and its membranes, in the region of the neck. The veins or sinuses which descend in the vertebral tube, between the theca vertebralis and the vertebræ, collect the blood from the spinal cord and its membranes, and form communications with the intercostal, lumbar, and sacral veins.

Besides these veins of the dura mater, and those of the brain, which empty themselves into the former, there are a number of small veins running through the various little foramina of the bones of the cranium, described in Part I., forming a communication between the sinuses and the exterior veins of the head; some of which run from without inwards, emptying themselves into the sinuses, while others emerge and join the exterior veins, but do not communicate with the sinuses; these are named the emissaria Santorini, or Venæ emissariæ.

I shall now describe the spinal cord.* This, which is

* Syn. Le prolongement rachidien: Spinal marrow: Vertebral marrow.

represented in Plates I. II. V., in *Figs.* 5, 6, 7, of Plate VII., in Plate X., in *Fig.* 1 of Plate XII., and in Plates XIII. and XIV., marked c, is continuous with the cerebrum and cerebellum, and like them consists of cineritious and medullary matter. It is seen in Plate I. and in *Fig.* 1 of Plate XII., letters c, to be a long cord of a roundish figure, encased in the spinal canal, and surrounded or protected by its membranes, the dura mater d, the arachnoid membrane *e*, and the vascular pia mater, the same as the cerebrum and cerebellum.

The spinal cord is considered by some to consist of four columns, two ascending to the cerebrum, and two descending from the cerebellum; by others, to consist only of two columns, the latter of which is substantiated by the indefatigable researches of Tiedemann, as will be shortly detailed. In the adult, the spinal cord, which appears to be a continuation of the cerebrum and the cerebellum, is larger at its commencement, where it is named the medulla oblongata,* marked G, G, F, F, in Plates X. and XIII., and tapers gradually in its descent to the second lumbar vertebra, where it ends by a conical point. In this extent, slight variations occur in its transverse diameter, as, for example, in the cervical portion, it is greater in the sacral than the atlantal extremes, which occurs also in the dorsal portion. Soemmering takes notice of a double swelling in this latter portion; but this is not always present. The cord has a fissure both on its anterior or sternal surface, and on its posterior or dorsal aspect, the latter of which is the more evident, as will be better understood from the fetal description. At this lat-

* Syn. Principium medullæ spinalis: Pars cephalica medullæ spinalis: Le bulbe rachidien: Cranial portion of the cord.

ter fissure, the pia mater entered, and the cineritious matter was deposited, the exterior of the spinal cord consisting of medullary matter, as represented in the sections displayed in Plate V., in *Figs.* 5 and 6 of Plate VII., and in Plate X. When the corpora pyramidalia g, g, are held apart, as in *Fig.* 6 of Plate VII., there are observed extending across the anterior fissure, small transverse fibres, which have been hitherto considered a decussation of the medullary fibres of the corpora pyramidalia; but Tiedemann observes, that these fibres are scarcely sufficiently numerous to warrant the conclusion of a complete decussation of the chief cords of the spinal marrow; he witnessed in the fourth month, some of the fibres proceeding from behind forwards from the right bundle to the left pyramid, and others from the left bundle to the right pyramid.

Throughout the extent of the spinal cord, the different spinal nerves derive their origin, and are variously arranged or divided by authors; by some, they are classed into eight cervical, twelve dorsal, five lumbar, and five sacral nerves, making in all thirty pairs, which is the most common arrangement; by others, the first cervical, which are also named the sub-occipital pair, are classed along with the cerebral nerves; a third arrangement is classing the glosso-pharyngeal, the nervi vagi, the lingual, and the accessory among the spinal nerves, making the cerebral only eight in number. Of these, the first and most ancient is as good as any other, all of them being arbitrary; and as the whole nerves are derived from the nervous centre, the brain and spinal cord, there appears less necessity for such divisions or classifications, which, on this very account, do not admit of a perspicuous arrangement. Thus we have seen so many nerves derive their sole origin

from the cerebrum, others from the cerebellum, others again partly from the one organ, and partly from the other; hence it would be fastidious to class the nerves into cerebral, cerebellar, and cerebro-cerebellar. Again, the nerves apparently arising from the medulla oblongata, which is strictly a portion of the spinal cord, would require to be classed separately, and here the sixth pair interferes; so that the old arrangement into cerebral and spinal nerves, is probably as good and perspicuous as any other. In Plate II. the spinal nerves are observed to have double origins from the spinal cord, the one fasciculus arising from the anterior or sternal aspect of the cord, and the other from the posterior or dorsal aspect. In Plate I., and *Fig.* 1 of Plate XII., which are both posterior views, we observe the medullary substance of the cord terminating as it were in a leash of nerves, which is named the cauda equina.

The fetal developement of the spinal cord throws more light on its organization, than all the dissections of anatomists. I formerly mentioned, that when the head and trunk of a fetus, between the fifth and sixth week, are examined, a canal or tube is found, containing a whitish and almost diaphanous fluid, the canal forming a rounded pouch in the head. At the seventh week, the spinal cord, bent like the spinal column, is very large and thick, compared to the size of the embryo, and particularly to that of the brain; it possesses the same thickness throughout its whole extent, has a pulpy white appearance, of the consistence of the white of an egg, and is marked on its posterior or dorsal aspect by a longitudinal groove into which the pia mater penetrates; the margins of this groove are very thin, and if separated by a flat needle, and held aside, the inner canal is continuous with the

fourth ventricle, and extends to the end of the cord, like that in the horse, and many other quadrupeds. The anterior or sternal surface of the cord consists of two strings or cords, separated by a slight longitudinal furrow. At the upper or atlantal extremity, the cord, after bending forwards, forms on each side a considerable projection, corresponding to a tubercle at the nape of the fetus; and above, or coronad to this projection, the canal is dilated, where it is continuous with the fourth ventricle. The substance of the cord and brain, when examined at this period of life with a suitable magnifier, appears to possess no fibrous structure, but to consist of extremely minute globules. At eleven weeks, the spinal cord extends along the back to the region of the sacrum, where it terminates in a point without caudiform expansion; it appears a little thicker only at the origin of the nerves of the pectoral and pelvic members, but its bulk is much augmented at the upper or atlantal extremity, where it is continuous with the brain. The two sides of the spinal cord give origin to the spinal nerves, the bulk of which is very considerable. The medulla oblongata is perceptibly thicker and broader, and inclines forwards, but the pyramidal and olivary eminences are not yet visible; its margins, or the restiform bodies, separate to form the fourth ventricle, while before and below, or glabellad and basilad, they are continuous with the crura cerebri, the annular protuberance not yet being formed. At the fourth month, the pyramidal bodies appear in the form of two oblong eminences, but the lateral surfaces are plain and uniform, there being no appearance of the corpora olivaria. Fibrous or linear portions can now be detached from the surface of the cord, along its whole length, but none transversely. Each half of the cord at the medulla

oblongata divides into three bundles, the posterior or restiform body, the middle, or that which subsequently forms the corpus olivare, and the anterior or pyramidal body, and which with the middle bundle is subsequently continued into the crus cerebri. The annular protuberance is now for the first time apparent, formed by medullary bands descending from the cerebellum.

At the fifth month, the spinal cord terminates at the sacrum, in a delicate filament, and the nerves arise distinctly by anterior and posterior roots. If a small blowpipe be inserted into the calamus scriptorius, with its point downwards or sacrad, the whole canal may be distended with air. Some of the fibres of the pyramidal bodies cross each other, and are continued forwards, above, or corono-iniad to the annular protuberance, to form the crura cerebri.

At the sixth month, the pyramidal bundles may be seen to cross at their inner edge, and proceed forwards, to traverse the annular protuberance, with the transverse fibres of which they are covered, and partly intermixed, and terminate in the crura cerebri. The olivary bodies, though broad, are still flat, and without the proper olive-shaped eminences; their component fibres do not mutually cross, but proceed forwards through the annular protuberance, and are then applied to the upper and outer part of the corpora pyramidalia, and contribute with them to form the crura cerebri: from these bundles, also fibres penetrate into the walls of the common mass of the corpora quadrigemina, some uniting with the corresponding ones of the opposite side, and others going forwards to the thalami.

At the seventh month, the spinal cord terminates in a point extending to the last lumbar vertebra, and in bulky

nervous threads corresponding with the caudiform expansion. The capacity of the canal is diminished, and its walls are covered with a thin layer of unfibrous or cineritious substance, which adheres in patches to the folds of the pia mater destined to clothe the canal. Each of the olivary bundles now support an olivary oval-shaped body, consisting of non-fibrous or cineritious pulp, deposited on the surface of the cerebral fibres, which proceed forwards or coronad to the common mass of the corpora quadrigemina.

At the eighth month, the canal of the spinal cord still exists, although much contracted by a soft vascular matter deposited on its inner wall.

At the ninth month, the spinal cord extends near the third lumbar vertebra, where it forms a considerable caudiform expansion; its dorsal portion is a little larger in its transverse diameter, as well as in those portions which give origin to the brachial and crural nerves. The pia mater, extremely vascular, penetrates by the anterior and posterior fissures, the latter of which, or the canal, is now small and narrow, and its walls support a thick bed, of a soft reddish substance, the cineritious matter, throughout which is distributed a multiplicity of vascular ramifications, produced by the pia mater, and which substance is most abundant at the origin of the nerves.

I have now demonstrated the brain according to the method of Vesalius, which is most generally practised in the schools, and shall next proceed to the description of the mode ascribed to Willis, and the Grecian anatomists. This consists in raising the posterior lobes of the cerebrum from the cerebellum, when we arrive at the corpora quadrigemina and the pineal gland, and penetrate between the lower or basilar surface of the fornix, and the tha-

lami, exposing at the same time the velum interpositum of Haller. We thus bring at once into view all the cavities, and if the arachnoid membrane and pia mater be removed, we observe their manner of communication. We perceive on each side of the fornix, which is now reflected forwards, the two lateral ventricles freely exposed, their roof formed by the corpus callosum and the contiguous medullary matter of the hemispheres, both of which are also reflected forwards. We perceive the septum lucidum, likewise reflected forwards and inverted, extending between the corpus callosum and the fornix, with the aperture which leads to its cavity, or the fifth ventricle, situated between the anterior crura of the fornix. We see, on the same level, the corpora striata, the tæniæ semicirculares, and the thalami, with the pineal gland a little below this level, the corpora quadrigemina still lower, and the valve of Vieussens beneath the latter bodies, and lastly the cerebellum, which rises to the level of the thalami. We observe between the thalami, the commissura mollis, with the foramen commune anterius immediately before or glabellad leading to the third ventricle and infundibulum, and glabellad to this foramen, the anterior crura of the fornix, with the anterior commissure extending across between the crura, but anterior or glabellad; posterior or iniad to the commissura mollis, we perceive the foramen commune posterius, with the pineal gland and its peduncles behind or iniad, and beneath or basilad to the latter, the posterior commissure, and still lower or basilad to the last, the iter à tertio ad quartum ventriculum, the roof of which channel is formed by this posterior commissure, the corpora quadrigemina and the valve of Vieussens. This method, therefore, enables us to comprehend the nature, extent, and com-

munication of the ventricles better than any other. I have not given a drawing of this mode, as it is extremely simple to understand, and easily displayed on the subject; it is probably more easily developed on the brain of the sheep than in that of man, in consequence of the smallness and shortness of the posterior lobes of the cerebrum. The reader may easily follow the above description, by comparing Plates II. V. VII. VIII. IX. and XIV.

It now remains to describe the brain after the manner adopted by Varolius and Vieussens, and followed by Gall and Spurzheim, which is the most natural order; at the same time keeping in view the researches of Tiedemann concerning the early formation of the brain. The chief objection to the description of Varolius, Vieussens, and Gall and Spurzheim, is, their considering the cerebellum and cerebrum to be produced by the spinal cord, an idea satisfactorily confuted by Tiedemann, who found, in the embryo between the fifth and sixth week after conception, a canal or tube, occupying the head and spine, filled with a whitish and nearly diaphanous fluid, which swelled out in the form of a round pouch in the head. This whitish fluid became gradually firmer, until it assumed the appearance and character of cerebral matter; so that the nervous system, as early as it is discernible, consists of the brain and spinal cord, and hence we may begin its description at any point. The supposition that there are four columns constituting the spinal cord, the two anterior being the ascending, and the two posterior the descending, is quite hypothetical, for, according to Tiedemann's researches, no such division can be found in the early state, where an open fissure, continuous from the fourth ventricle to the cauda equina only presents itself.

I shall begin with the medullary fibres G, G, of the cor-

pora pyramidalia, in *Fig.* 4 of Plate XII., and in Plates XIII. and XIV.; in Plates XII. and XIV. they are observed to ascend through the cineritious substance of the tuber annulare E, forwards or glabellad through that forming the corpus niger N,* diverging upwards or coronad in the crura g, g, cerebri, radiating upwards and forwards, or coronad and glabellad, into the thalami f, and into the corpora striata G*, and lastly terminating in the hemispheres A, A, Plate XV. The olivary bundles of medullary fibres partly join those of the corpora pyramidalia to constitute the crura cerebri, and partly form the corpora quadrigemina e, *e*. The medullary fibres of the processus cerebelli ad medullam oblongatam *o*, or restiform bodies, Plate XIII., and *Fig.* 2, Plate XII., ascend to form the cerebellum. Some of the fibres of the corpora pyramidalia descend to the corpora mamillaria. The preceding is the manner in which the medullary fibres are traced by Varolius, Vieussens, and Gall and Spurzheim, combined with the modification consequent on the discoveries of Tiedemann, the latter of which I shall now detail in a connected order, to confirm the above.

Under the description of the spinal cord, I traced the medullary fibres of the pyramidal bundles through the tuber annulare into the crura cerebri; but I shall retrace the description to the fetus at the seventh week. At this period, the crura cerebri are in the form of two lengthened cords, at the bottom of the aqueduct of Sylvius, which is very large and open. From the summit of the crura or cords, membranous and inverted figures corresponding to the corpora quadrigemina, arise; anterior to which, two round protuberances, the thalami,

* The corpus niger is merely a little cineritious matter, extremely vascular, the veins of which contribute to deepen the colour; and hence the term black.

are seen separated above by the aqueduct of Sylvius, but joined below or basilad, where they are supported or formed by the crura cerebri; still more anterior to these last, and joined or applied to them, two other eminences, the corpora striata, are observable: lastly, from each of these latter, a membranous production extends inwards and backwards, or centrad and iniad, to form the hemispheres of the cerebrum. The spinal cord, immediately posterior or iniad to the crura cerebri and the corpora quadrigemina, gives off a thin narrow plate, which inclines inwards, but does not unite to form the cerebellum, as described in page 23. The dura mater, at this period, is found enveloping the brain and spinal cord, and dividing the cranial cavity into two equal parts, through the medium of the tentorium. The pia mater adheres intimately to the cerebral substance. At nine weeks, the corpora quadrigemina appear two oblong oval eminences, convex and smooth above, separated by a longitudinal furrow, and formed by two plates, mutually inclining towards each other, which issue from the crura cerebri. The thalami appear convex and smooth above, forming between them the third ventricle, which communicates freely and openly with the aqueduct of Sylvius, and the fourth ventricle. The corpora striata appear two distended bodies, from which the cerebral substance in the form of a thin membrane bends backwards and inwards, or iniad and centrad, to form the rudiments of the hemispheres.

At eleven weeks, the dura mater is seen to penetrate between the hemispheres, so as to form the falx cerebri; the tentorium is well marked; the longitudinal and lateral sinuses are formed; the pia mater of some thickness is observed forming the choroid plexus; and the restiform bodies, at their anterior and inferior, or gla-

bellar and basilar aspect, are seen to be continuous with the crura cerebri, which union is very distinct, in consequence of the annular protuberance not being yet formed. On the upper or coronal aspect of the brain, are seen the cerebellum, the rudiments of the corpora quadrigemina, uncovered by the hemispheres of the cerebrum, which are very minute, and are separated by a deep fissure. On the inferior or basilar aspect, are seen the crura cerebri, anterior or glabellar to which a large mass, indicating the commencement of the mamillary eminences, the pituitary gland hollow and communicating with the third ventricle by the infundibulum, the union of the optic nerves, the olfactory nerves very short and ending in a bulbous enlargement, and the two hemispheres of the cerebrum, the middle and posterior lobes being mingled together.

The rudimental substance of the corpora quadrigemina is divided into two portions by a slight longitudinal furrow, which does not penetrate into the aqueduct of Sylvius, this being now shut up by the union of these bodies, and by the extension of the valve of Vieussens. The thin walls of the corpora quadrigemina inclose a spacious cavity continuous before with the third, and behind with the fourth ventricle.

The thalami now appear in the form of two oblong smooth convex massive eminences, which, when separated, expose the posterior commissure, and the third ventricle, onwards to the infundibulum. The anterior lobes of the cerebrum are now distinct, but the middle and posterior resemble two appendages, placed before and on the sides of the crura cerebri; all of them are smooth on the surface, there being no appearance of furrows or convolutions. When the falx is removed, and the hemispheres

held apart, the thalami and third ventricle are seen, the corpus callosum and fornix not yet being formed. Anterior or glabellad to the thalami, the hemispheres are joined by the origin or generative point of the corpus callosum: these resemble two membranous vesicles, about the fourth of a line thick, containing the choroid plexus of enormous bulk, and, when everted, they are seen to be formed by the fan-like expansion of the corpora striata, which bodies are now more fully developed. The membranous hemispheres, after bending backwards and inwards, to form the ventricles and cover the corpora striata, unite before the thalami to form the origin of the corpus callosum. Previous to this period, the membranous hemispheres are so little developed, that they do not cover the thalami, but after the eleventh week they become so large, that they are gradually prolonged backwards or iniad, until they terminate by stretching over the corpora quadrigemina and the cerebellum.

From the corpora mamillaria, two narrow medullary stripes, the anterior pillars of the fornix, ascend before, or glabellad to the thalami, in a curved figure, upwards and backwards, or coronad and iniad, to these bodies, and join with their outer margins the membranous hemispheres, but remain apart on their inner or mesial margins, so as to leave a free communication between the lateral and third ventricles. The olfactory nerves are very bulky, and similar to the mamillary eminences of quadrupeds, are hollow, and communicate with the anterior cornu of the lateral ventricles. The optic and other nerves are visible.

At the fourth month, the pia mater, firm and traversed with numerous blood-vessels, covers the brain and spinal cord, and penetrates into the cavities. On the base of

the brain, the annular protuberance is now apparent, but very narrow, and consisting of transverse fibres, which cover the spinal cord, and unite in the mesial line. The olfactory nerves are seen to issue from the fissura Sylvii. The middle and posterior lobes of the cerebrum are now distinguishable by a slight furrow. The fifth pair of nerves are seen to derive their origin either from, or immediately before, the annular protuberance; the other nerves arising from their apparent external points of origin. The restiform bodies are seen to send fibres both to the cerebellum and the annular protuberance. The upper or coronal surface of the cerebrum has some furrows here and there. The thalami are now united by the posterior commissure, and the pineal gland small and flat with its peduncles are now apparent; so also is the anterior commissure.

The two anterior pillars of the fornix, after ascending near the corpus callosum, unite, and almost immediately again separate, and extend backwards or iniad in the figure of thin plates, which cover and surround the thalami, and descend to the base of the posterior lobes of the hemispheres, thus forming part of the body, the corpora fimbriata, and the posterior crura or pillars of the fornix. The Hippocampi are also observable at this period.

The medullary matter can now be distinctly traced. The medullary fibres of the medulla oblongata proceed above or corono-glabellad of the tuber annulare, give off ascending fibres to the corpora quadrigemina, mutually separate to the right and left, and penetrate into, or form the thalami; some fibres descending to the corpora mamillaria. The remaining fibres, which are very numerous, proceed under or basilad of the thalami,

forwards and outwards, or glabellad and laterad, and radiate like the branches of a fan, into the striated bodies, and into the membrane of the hemispheres, upwards, forwards, outwards, and backwards. Some are reflected inwards, or mesiad, to form the roof of the lateral ventricles, and afterwards descend to join the fornix; those of the two sides uniting anteriorly or glabellad to form the corpus callosum.

At the fifth month, there are visible, on various points of the pia mater, thin transparent patches, which are the rudiments of the tunica arachnoides. Several deep furrows and convolutions are now apparent on the mesial or inner aspect of the hemispheres where they are applied to the falx cerebri, which convolutions make corresponding elevations or folds in the interior of the lateral ventricles; but no convolutions, furrows, or folds, are found on the outer or peripheral aspect. The septum lucidum is seen arising, by two very thin plates, from the anterior pillars of the fornix, to be attached to the corpus callosum, thus leaving a free communication between the fifth and third ventricles. The fornix is now united to the posterior or inial aspect of the corpus callosum, where its two portions also join each other. A deep fissure is observable between the corpus striatum and the thalamus.

At the sixth month, the falx cerebelli is observable, and the arachnoid membrane distinct. The posterior lobes of the cerebrum now cover the corpora quadrigemina, and almost the whole cerebellum, although in the preceding month, they do not entirely cover the corpora quadrigemina. The external or lateral walls of the lateral ventricles are considerably increased in thickness, much more so than the internal or mesial; the ventricles themselves are very spacious, of an oblong form, and elevated above, or coronad to, the corpus callosum; the three

cornua are very distinct. The choroid plexus is very voluminous, and sends out vessels here and there over the cavities. The laminæ of the septum lucidum are joined so as to form the fifth ventricle, which has an aperture between the anterior crura of the fornix, near the foramen of Monro. The corpus callosum extends more backwards or iniad, but not yet sufficient to cover the thalami and third ventricle. The medullary substance forming the corpora quadrigemina is much thicker, thus rendering the iter à tertio ad quartum ventriculum considerably narrower. The optic tracts, when traced to the thalami, and the corpora quadrigemina, have now the corpus geniculatum externum, which can be raised along with the tract, in the form of a layer, from these bodies. On the basis, the tuber annulare is much broader, consisting of transverse fibres, descending from the cerebellum, and uniting on the mesial line, where the basilar artery makes a longitudinal furrow.

At the seventh month, the cerebrum is greatly increased in volume, the posterior lobes now covering and even extending beyond the cerebellum, and several furrows and convolutions are observable on the surface. The corpus callosum covers the thalami, and consists of transverse fibres passing from one hemisphere to the other; the fornix is now complete, the two sides being united by a thin plate or layer of medullary matter, which corresponds with that portion named lyra; the corpora quadrigemina are divided by a transverse line or furrow, rendering them complete and distinct, the two superior, or nates, being a degree larger than the two inferior, or testes, and their parietes so thick, that the iter à tertio ad quartum ventriculum may be said to be perfect. The cerebral nerves are very large, compared to the mass of the brain.

At the eighth month, the brain is almost perfect in its organization, the furrows and convolutions are more numerous on the anterior and middle lobes of the cerebrum, than on the posterior. When the pia mater is detached from the outer or peripheral surface of the cerebrum, a layer of soft substance adheres to this membrane; and if this be removed by immersion in water, the pia mater presents a multiplicity of flocculent processes, which are very delicate blood-vessels, that penetrate the substance of the brain.

At the ninth month, the commissura mollis is formed, and the tænia semicircularis is a soft mass, traversed by blood-vessels, beneath which runs a large vessel, that when removed, detaches also the tænia.

With respect to the cineritious and medullary substances which compose the brain, it is impossible to distinguish between them in the fetus. All the parts of which the fetal brain consists, are formed of a homogenous reddish-white substance, the tinge of which depends on the numerous delicate blood-vessels that are distributed throughout its substance. In the corpora striata, the thalami, &c., the blood-vessels are found to be more voluminous and abundant. The outer layer, which in the adult is named cineritious, is softer in the fetus than the inner or medullary.

INDEX

OF

THE LETTERS OF REFERENCE

IN

PART VIII.

THE BRAIN, SECOND AND CONCLUDING PORTION.

PLATE VIII.

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F, Thalamus nervi optici
G, near *w*, Corpus striatum
G, near 𝔡, Inferior longitudinal sinus
H, Pineal gland

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e, Corpus bigeminum superius vel natis
f, Anterior tubercle of thalamus
i, Vena magna Galeni
k, k, Anterior pillars of fornix

a, Foramen commune posterius
d, Tentorium cerebelli
f, Corpus geniculatum internum
h, Peduncle of pineal gland
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p, Posterior commissure
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t, Tænia semicircularis
v, Artery of corpus callosum
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𝔡, Falx cerebri

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PLATE IX.

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Y, Section of cranium

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f, Anterior tubercle of thalamus
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a, Foramen commune posterius
c, Anterior commissure
e, Testis
h, Peduncle of pineal gland
i, Choroid plexus
p, Posterior commissure
r, Posterior artery of cerebrum
t, Tænia semicircularis
v, Artery of corpus callosum
w, Corpus callosum
x, Superior longitudinal sinus
y, Middle artery of cerebrum
z, Lateral sinus

𝔥, Hippocampus major

4, or IV, Fourth sinus

PLATE X.

B, Hemisphere, or lobe of cerebellum
E, Tuber annulare
F, Corpus olivare
G, Corpus pyramidale
R, Vertebral artery
Y, Section of cranium

a, Anterior lobe of cerebrum

a, Middle lobe of cerebrum
e, Posterior artery of cerebellum
i, Infundibulum
o, Anterior artery of cerebellum
q, Basilar artery
r, Posterior artery of cerebrum
s, *s*, Corpora mamillaria
t, Lateral communicant artery
u, Anterior communicant artery
v, Artery of corpus callosum
y, Middle artery of cerebrum

1, Olfactory nerve
2, Optic nerve
3, Motor oculi nerve
4, Pathetic nerve
5, Trigeminal nerve
6, Abducens nerve
7, Facial nerve
8, Auditory nerve
9, Glosso-pharyngeal nerve
10, Nervus vagus
11, Accessory nerve to nervus vagus
12, Lingual nerve

PLATE XI.

B, Transverse spinous process of sphenoid bone
C, Cavernous sinus
E, Dura mater, extended over sella turcica, to cover pituitary gland
R, Vertebral artery
Y, Section of cranium
Z, The Nose

b, Crista galli
d, Tentorium cerebelli
i, Infundibulum
k, Foramen magnum
o, Ophthalmic artery
p, Petrosal sinus
u, Inferior depressions of occipital bone
x, Superior longitudinal sinus
z, Lateral sinus

𝔡, Falx cerebri

∂, Falx cerebelli

1, Olfactory nerve
2, Optic nerve
3, Motor oculi
4, Pathetic nerve
5, Trigeminal nerve
5*, Middle meningeal artery
6, Abducens nerve
7, Facial nerve
8, Auditory nerve
9, Glosso-pharyngeal nerve
10, Nervus vagus
11, Accessory nerve to nervus vagus
12, Lingual nerve
19, Internal carotid artery

IV, Fourth sinus

PLATE XII. *Fig.* 1.

C, Spinal cord

d, Theca vertebralis

e, Ligamentum denticulatum

Fig. 2.

E, Tuber annulare
F, Corpus olivare
G, Corpus pyramidale

e, Natis

e, Testis
l, Processus cerebelli ad testis
n, Processus cerebelli ad tuber annulare
o, Processus cerebelli ad medullam oblongatam

PLATE XII. *Fig.* 2. (*Continued.*)

4, Pathetic nerve
5, Trigeminal nerve
6, Abducens nerve
7, Facial nerve
8, Auditory nerve
9, Glosso-pharyngeal nerve
10, Nervus vagus
11, Accessory nerve to nervus vagus
12, Lingual nerve

Fig. 3.

D, Corpus dentatum
E, Tuber annulare
F, Corpus olivare
G, Corpus pyramidale

Fig. 4.

B, Cerebellum
E, Tuber annulare
F, Thalamus nervi optici
G, Corpus pyramidale
G*, Corpus striatum
N, Corpus niger
e, Natis
g, Crus cerebri

e, Testis
s, Corpus mamillare

Fig. 5.

C, Spinal cord
E, Tuber annulare
F, Thalamus nervi optici
e, Testis
i, Infundibulum
s, *s*, Corpora mamillaria

a, Anterior lobe of cerebrum
e, Natis
g, Crus cerebri
1, Olfactory nerve
2, Optic nerve
2*, Optic tract

Fig. 6.

A, Occipital bone
B, Atlas
C, Dentata
D, Spinous processes of cervical vertebra
R, Vertebral artery
X, Body of vertebra

PLATE XII. *Fig.* 6. (*Continued.*)

d, Occipital artery
e, Branch of communication between vertebral and occipital artery
k, Foramen magnum
22, Second cervical nerve
23, Third cervical nerve

PLATE XIII.

B, Hemisphere of cerebellum
E, Tuber annulare
F, Corpus olivare
G, Corpus pyramidale

a, Anterior lobe of cerebrum
g, Crus cerebri

a, Middle lobe of cerebrum
i, Infundibulum

n, Processus cerebelli ad tuber annulare
o, Processus cerebelli ad medullam oblongatam
s, *s*, Corpora mamillaria

𝔄, Posterior lobe of cerebrum

1, Olfactory nerve
2, Optic nerve
2*, Optic tract

PLATE XIV.

B, Cerebellum
C, near d, Spinal cord
E, Tuber annulare
F, Thalamus nervi optici
G, Corpus pyramidale
H, Pineal gland
K, Fornix
N, Corpus niger
R, Vertebral artery
V, Valve of Vieussens

d, Theca vertebralis
e, Natis
g, Crus cerebri
i, Vena magna Galeni
k, Anterior pillar of fornix

PLATE XIV. (*Continued.*)

e, Testis
l, Processus cerebelli ad testes
m, Commissure of cerebellum
n, Processus cerebelli ad tuber annulare
o, Processus cerebelli ad medullam oblongatam
p, Posterior commissure
q, Basilar artery
r, Posterior artery of cerebrum
u, Artery of corpus callosum
w, Corpus callosum
x, Superior longitudinal sinus
z, Lateral sinus

3, Third ventricle
4, near *o* and *n*, Fourth ventricle
4, or IV, near *x* and *z*, Fourth sinus
5, Fifth ventricle
19, Internal carotid artery
- - - - -, Iter à tertio ad quartum ventriculum

PLATE XV.

A, Hemisphere of cerebrum
D, Dura mater
Y, Section of cranium

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